Preliminary conclusions regarding the updated status of listed ESUs of West Coast salmon and steelhead

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February 2003

Co-manager review draft

[This is a draft document being provided to state, tribal, and federal comanagers for technical review.]

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B. Steelhead trout

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This section deals specifically with steelhead trout. It is part of a larger report, the remaining sections of which can be accessed from the same website used to access this section (http://www.nwfsc.noaa.gov/). The main body of the report (Background and Introduction) contains background information and a description of the methods used in the risk analyses.

B. STEELHEAD

B.1. BACKGROUND AND HISTORY OF LISTINGS

Background

Steelhead is the name commonly applied to the anadromous form of the biological species *Oncorhynchus mykiss*. The present distribution of steelhead extends from Kamchatka in Asia, east to Alaska, and down to southern California (NMFS 1999), although the historic range of *O. mykiss* extended at least to the Mexico border (Busby et al. 1996). *O. mykiss* exhibit perhaps the most complex suite of life history traits of any species of Pacific salmonid. They can be anadromous or freshwater resident (and under some circumstances, apparently yield offspring of the opposite form). Those that are anadromous can spend up to 7 years in fresh water prior to smoltification, and then spend up to 3 years in salt water prior to first spawning. The half-pounder life-history type in Southern Oregon and Northern California spends only 2 to 4 months in salt water after smoltification, then returns to fresh water and outmigrates to sea again the following spring without spawning. This species can also spawn more than once (iteroparous), whereas all other species of *Oncorhynchus* except *O. clarki* spawn once and then die (semelparous). The anadromous form is under the jurisdiction of the National Marine Fisheries Service (NMFS), while the resident freshwater forms, usually called “rainbow” or “redband” trout, are under the jurisdiction of U. S. Fish and Wildlife Service (FWS).

Within the range of West Coast steelhead, spawning migrations occur throughout the year, with seasonal peaks of activity. In a given river basin there may be one or more peaks in migration activity; since these *runs* are usually named for the season in which the peak occurs, some rivers may have runs known as winter, spring, summer, or fall steelhead. For example, large rivers, such as the Columbia, Rogue, and Klamath rivers, have migrating adult steelhead at all times of the year. There are local variations in the names used to identify the seasonal runs of steelhead; in Northern California, some biologists have retained the use of the terms spring and fall steelhead to describe what others would call summer steelhead.

Steelhead can be divided into two basic reproductive ecotypes, based on the state of sexual maturity at the time of river entry, and duration of spawning migration (Burgner et al. 1992). The *stream-maturing* type (summer steelhead in the Pacific Northwest and Northern California) enters fresh water in a sexually immature condition between May and October and requires several months to mature and spawn. The *ocean-maturing* type (winter steelhead in the Pacific Northwest and Northern California) enters fresh water between November and April with well-developed gonads and spawns shortly thereafter. In basins with both summer and winter steelhead runs, it appears that the summer run occurs where habitat is not fully utilized by the winter run or a seasonal hydrologic barrier, such as a waterfall, separates them. Summer steelhead usually spawn farther upstream than winter steelhead (Withler 1966, Roelofs 1983, Behnke 1992). Coastal streams are dominated by winter steelhead, whereas inland steelhead of the Columbia River Basin are almost exclusively summer steelhead. Winter steelhead may have been excluded from inland areas of the Columbia River Basin by Celilo Falls or by the considerable migration distance from the ocean. The Sacramento-San Joaquin River Basin may have historically had multiple runs of steelhead that probably included both ocean-maturing and stream-maturing stocks (CDFG 1995, McEwan and Jackson 1996). These steelhead are referred to as winter steelhead by the California Department of Fish and Game (CDFG); however, some biologists call them fall steelhead (Cramer et. al 1995). It is thought that hatchery practices and modifications in the hydrology of the basin caused by large-scale water diversions may have altered the migration timing of steelhead in this basin (D. McEwan, pers. commun.).

Inland steelhead of the Columbia River Basin, especially the Snake River Subbasin, are commonly referred to as either *A-run* or *B-run*. These designations are based on a bimodal migration of adult steelhead at Bonneville Dam (235 km from the mouth of the Columbia River) and differences in age (1- versus 2-ocean) and adult size observed among Snake River steelhead. It is unclear, however, if the life history and body size differences observed upstream are correlated back to the groups forming the bimodal migration observed at Bonneville Dam. Furthermore, the relationship between patterns observed at the dams and the distribution of adults in spawning areas throughout the Snake River Basin is not well understood. A-run steelhead are believed to occur throughout the steelhead-bearing streams of the Snake River Basin and the inland Columbia River; B-run steelhead are thought to be produced only in the Clearwater, Middle Fork Salmon, and South Fork Salmon Rivers (IDFG 1994).

The *half-pounder* is an immature steelhead that returns to fresh water after only 2 to 4 months in the ocean, generally overwinters in fresh water, and then outmigrates again the following spring. Half-pounders are generally less than 400 mm and are reported only from the Rogue, Klamath, Mad, and Eel Rivers of Southern Oregon and Northern California (Snyder 1925, Kesner and Barnhart 1972, Everest 1973, Barnhart 1986); however, it has been suggested that as mature steelhead, these fish may only spawn in the Rogue and Klamath River Basins (Cramer et al. 1995). Various explanations for this unusual life history have been proposed, but there is still no consensus as to what, if any, advantage it affords to the steelhead of these rivers.

As mentioned earlier, *O. mykiss* exhibits varying degrees of anadromy. Non-anadromous forms are usually called rainbow trout; however, nonanadromous *O. mykiss* of the inland type are often called Columbia River redband trout. Another form occurs in the upper Sacramento River and is called Sacramento redband trout. Although the anadromous and nonanadromous forms have long been taxonomically classified within the same species, the exact relationship between the forms in any given area is not well understood. In coastal populations, it is unusual for the two forms to co-occur; they are usually separated by a migration barrier, be it natural or manmade. In inland populations, co-occurrence of the two forms appears to be more frequent. Where the two forms co-occur, "it is possible that offspring of resident fish may migrate to the sea, and offspring of steelhead may remain in streams as resident fish" (Burgner et al. 1992, p. 6; see also Shapovalov and Taft 1954, p. 18). Mullan et al. (1992) found evidence that in very cold streams, juvenile steelhead had difficulty attaining mean threshold size for smoltification and concluded that most fish in the Methow River in Washington that did not emigrate downstream early in life were thermally-fated to a resident life history regardless of whether they were the progeny of anadromous or resident parents. Additionally, Shapovalov and Taft (1954) reported evidence of *O. mykiss* maturing in fresh water and spawning prior to their first ocean migration; this life-history variation has also been found in cutthroat trout (*O. clarki*) and some male chinook salmon (*O. tshawytscha*).

In May 1992, NMFS was petitioned by the Oregon Natural Resources Council (ONRC) and 10 co-petitioners to list Oregon's Illinois River winter steelhead (ONRC et al. 1992). NMFS concluded that Illinois River winter steelhead by themselves did not constitute an ESA "species" (Busby et al. 1993, NMFS 1993a). In February 1994, NMFS received a petition seeking protection under the Endangered Species Act (ESA) for 178 populations of steelhead (anadromous *O. mykiss*) in Washington, Idaho, Oregon, and California. At the time, NMFS was conducting a status review of coastal steelhead populations (*O. m. irideus*) in Washington, Oregon, and California. In response to the broader petition, NMFS expanded the ongoing status review to include inland steelhead (*O. m. gairdneri*) occurring east of the Cascade Mountains in Washington, Idaho, and Oregon.

In 1995, the steelhead Biological Review Team (BRT) met to review the biology and ecology of West Coast steelhead. After considering available information on steelhead genetics, phylogeny, and life history, freshwater ichthyogeography, and environmental features that may affect steelhead, the BRT identified 15 ESUs—12 coastal forms and three inland forms. After considering available information on population abundance and other risk factors, the BRT concluded that five steelhead ESUs (Central California Coast, South-Central California Coast, Southern California, Central Valley, and Upper Columbia River) were presently in danger of extinction, five steelhead ESUs (Lower Columbia River, Oregon Coast, Klamath Mountains Province, Northern California, and Snake River Basin) were likely to become endangered in the foreseeable future, four steelhead ESUs (Puget Sound, Olympic Peninsula, Southwest Washington, and Upper Willamette River) were not presently in significant danger of becoming extinct or endangered, although individual stocks within these ESUs may be at risk, and one steelhead ESU (Middle Columbia River) was not presently in danger of extinction but the BRT was unable to reach a conclusion as to its risk of becoming endangered in the foreseeable future.

Of the 15 steelhead ESUs identified by NMFS, five are not listed under the ESA: Southwest Washington, Olympic Peninsula, and Puget Sound (Federal Register, Vol. 61, No. 155, August 9, 1996, p. 41558), Oregon Coast (Federal Register, Vol. 63, No. 53, March 19, 1998, p. 13347), and Klamath Mountain Province (Federal Register, Vol. 66, No. 65, April 4, 2001, p. 17845); eight are listed as threatened: Snake River Basin, Central California Coast and South-Central California Coast (Federal Register, Vol. 62, No. 159, August 18, 1997, p. 43937), Lower Columbia River, California Central Valley (Federal Register, Vol. 63, No. 53, March 19, 1998, p. 13347), Upper Willamette River, Middle Columbia River (Federal Register, Vol. 64, No. 57, March 25, 1999, p. 14517), and Northern California (Federal Register, Vol. 65, No. 110, June 7, 2000, p.36074), and two are listed as endangered: Upper Columbia River and Southern California (Federal Register, Vol. 62, No. 159, August 18, 1997, p. 43937).

The West Coast steelhead BRT[1] met in January 2003 to discuss new data received and to determine if the new information warranted any modification of the conclusions of the original

[1] The biological review team (BRT) for the updated status review for West Coast steelhead included, from the NMFS Northwest Fisheries Science Center: Thomas Cooney, Dr. Robert Iwamoto, Gene Matthews, Dr. Paul McElhany, Dr. James Myers, Dr. Mary Ruckelshaus, Dr. Thomas Wainwright, Dr. Robin Waples, and Dr. John Williams; from NMFS Southwest Fisheries Science Center: Dr. Peter Adams, Dr. Eric Bjorkstedt, Dr. David Boughton, Dr. John Carlos Garza, Dr. Steve Lindley, and Dr. Brian Spence; from the U.S. Fish and Wildlife Service, Abernathy, WA: Dr. Donald Campton; and from the USGS Biological Resources Division, Seattle: Dr. Reginald Reisenbichler.

BRTs. This report summarizes new information and the preliminary BRT conclusions on the following ESUs: Snake River Basin, Upper Columbia River, Middle Columbia River, Lower Columbia River, Upper Willamette River, Northern California, Central California Coast, South-Central California Coast, Southern California, and California Central Valley.

Resident fish

As part of this status review update process, a concerted effort was made to collect biological information for resident populations of *O. mykiss.* Information from listed ESUs in Washington, Oregon, and Idaho is contained in a draft report by Kostow (2003), and the sections below summarize relevant information from that report for specific ESUs. A table (Appendix B.5.1) summarizes information about resident *O. mykiss* populations in California.

The BRT had to consider in more general terms how to conduct an overall risk assessment for an ESU that includes both resident and anadromous populations, particularly when the resident individuals may outnumber the anadromous ones but their biological relationship was unclear or unknown. Some guidance is found in Waples (1991), which outlines the scientific basis for the NMFS ESU policy. That paper suggested that an ESU that contains both forms could be listed based on a threat to only one of the life history traits "if the trait were genetically based and loss of the trait would compromise the 'distinctiveness' of the population" (p. 16). That is, if anadromy were considered important in defining the distinctiveness of the ESU, loss of that trait would be a serious ESA concern. In discussing this issue, the NMFS ESU policy (FR notice citation) affirmed the importance of considering the genetic basis of life history traits such as anadromy, and recognized the relevance of a question posed by one commenter: "What is the likelihood of the nonanadromous form giving rise to the anadromous form after the latter has gone locally extinct?"

The BRT also discussed another important consideration, which is the role anadromous populations play in providing connectivity and linkages among different spawning populations within an ESU. An ESU in which all anadromous populations had been lost and the remaining resident populations were fragmented and isolated would have a very different future evolutionary trajectory than one in which all populations remained linked genetically and ecologically by anadromous forms.

In spite of concerted efforts to collect and synthesize available information on resident forms of *O. mykiss*, existing data are very sparse, particularly regarding interactions between resident and anadromous forms (Kostow 2003). The BRT was frustrated by the difficulties of considering complex questions involving the relationship between resident and anadromous forms, given this paucity of key information. To help focus this issue, the BRT considered a hypothetical scenario that has varying degrees of relevance to individual steelhead ESUs. In this scenario, the once-abundant and widespread anadromous life history is extinct or nearly so, but relatively healthy native populations of resident fish remain in many geographic areas. The question considered by the BRT was the following: Under what circumstances would you conclude that such an ESU was not in danger of extinction or likely to become endangered? The BRT identified the required conditions as:

1) The resident forms are capable of maintaining connectivity among populations to the extent that historic evolutionary processes of the ESU are not seriously disrupted;
2) The anadromous life history is not permanently lost from the ESU but can be regenerated from the resident forms.

Regarding the first criterion, although some resident forms of salmonids are known to migrate considerable distances in freshwater, extensive river migrations have not been demonstrated to be an important behavior for resident *O. mykiss*, except in rather specialized circumstances (e.g., forms that migrate from a stream to a large lake or reservoir as a surrogate for the ocean). Therefore, the BRT felt that loss of the anadromous form would, in most cases, substantially change the character and future evolutionary potential of steelhead ESUs. Regarding the second criterion, it is well established that resident forms of *O. mykiss* can occasionally produce anadromous migrants, and vice versa (Mullan et al. 1992, Zimmerman and Reeves 2000, Kostow 2003), just as has been shown for other salmonid species (e. g., *O. nerka,* Foerster 1947, Fulton and Pearson 1981, Kaeriyama et al. 1992; coastal cutthroat trout *O. clarki clarki,* Griswold 1996, Johnson et al. 1999; brown trout *Salmo trutta,* Jonsson 1985; and Arctic char *Salvelinus alpinus*, Nordeng 1983). However, available information indicates that the incidence of these occurrences is relatively rare, and there is even less empirical evidence that, once lost, a self-sustaining anadromous run can be regenerated from a resident salmonid population. Although this must have occurred during the evolutionary history of *O. mykiss,* the BRT found no reason to believe that such an event would occur with any frequency or within a specified time period. This would be particularly true if the conditions that promote and support the anadromous life history continue to deteriorate. In this case, the expectation would be that natural selection would gradually eliminate the migratory or anadromous trait from the population, as individuals inheriting a tendency for anadromy migrate out of the population but do not survive to return as adults and pass on their genes to subsequent generations.

Given the above considerations, the BRT focused primarily on information for anadromous populations in the risk assessments for steelhead ESUs. However, as discussed below in the "BRT Conclusions" section, the presence of relatively numerous, native resident fish was considered to be a mitigating risk factor for some ESUs.

B.2.7 CENTRAL CALIFORNIA COAST STEELHEAD

B.2.7.1 Previous BRT Conclusions

The Central California Coast ESU inhabits coastal basins from the Russian River (Sonoma County), to Soquel Creek (Santa Cruz County) inclusive (Busby et al. 1996). Also included in this ESU are populations inhabiting tributaries of San Francisco and San Pablo bays. The ESU is composed only of winter-run fish.

Summary of major risks and status indicators

Risks and limiting factors—Two significant habitat blockages are the Coyote and Warm Springs Dams in the Russian River watershed; data indicated that other smaller fish passage problems were widespread in the geographic range of the ESU. Other impacts noted in the status report were: urbanization and poor land-use practices; catastrophic flooding in 1964 causing habitat degradation; and dewatering due to irrigation and diversion. Principal hatchery production in the region comes from the Warm Springs Hatchery on the Russian River, and the Monterey Bay Salmon and Trout Project on a tributary of Scott Creek. At the time of the status review there were other small private programs producing steelhead in the range of the ESU, reported by Bryant (1994) to be using stocks indigeneous to the ESU, but not necessarily to the particular basin in which the program was located. There was no information on the actual contribution of hatchery fish to naturally spawning populations.

Status indicators—One estimate of historical (pre-1960s) abundance was reported by Busby et al. (1996): Shapovalov and Taft (1954) described an average of about 500 adults in Waddell Creek (Santa Cruz County) for the 1930s and early 1940s. A bit more recently, Johnson (1964) estimated a run size of 20,000 steelhead in the San Lorenzo River before 1965, and CDFG (1965) estimated an average run size of 94,000 steelhead for the entire ESU, for the period 1959-1963 (see Table B.2.7.5 for a breakdown of numbers by basin). The analysis by CDFG (1965) was compromised by the fact that for many basins, the data did not exist for the full 5-year period. The authors of CDFG (1965) state that "estimates given here which are based on little or no data should be used only in outlining the major and critical factors of the resource."

Recent data for the Russian and San Lorenzo Rivers (CDFG 1994, Reavis 1991, Shuman 1994[13]; see Table B.2.7.5) suggested that these basins had populations smaller than 15% of the size that they had had 30 years previously. These two basins were thought to have originally contained the two largest steelhead populations in the ESU.

A status review update conducted in 1997 (Schiewe 1997) concluded that slight increases in abundance occurred in the 3 years following the status review, but the analyses on which these conclusions were based had various problems, including inability to distinguish hatchery and wild fish, unjustified expansion factors, variance in sampling efficiency on the San Lorenzo River. Presence/absence data compiled by P. Adams (SWFSC, personal communication)

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[13] The basis for the estimates provided by Shuman (1994) appears to be questionable.

Table B.2.7.5. Summary of estimated runs sizes for the Central Coast steelhead ESU, reproduced from Busby et al. (1996), Tables 19 & 20.

River basin	Estimate of Run Size	Year	Reference
Russian River	65,000	1970	CACSS (1988)
	1750 – 7000	1994	McEwan and Jackson (1996), CDFG (1994)
Lagunitas Creek	500		CDFG (1994)
	400 – 500	1990s	McEwan and Jackson (1996)
San Gregorio	1,000	1973	Coots (1973)
Waddell Creek	481	1933–1942	Shapovolov and Taft (1954)
	250	1982	Shuman (1994)[14]
	150	1994	Shuman (1994)[14]
Scott Creek	400	1991	Nelson (1994)
	<100	1991	Reavis (1991)
	300	1994	Titus et al. (MS)
San Vicente Creek	150	1982	Shuman (1994)[14]
	50	1994	Shuman (1994)[14]
San Lorenzo River	20,000	Pre-1965	Johnson (1964), SWRCB (1982)
	1,614	1977	CDFG (1982)
	>3,000	1978	Ricker and Butler (1979)
	600	1979	CDFG (1982)
	3,000	1982	Shuman (1994)[14]
	"few"	1991	Reavis (1991)
	<150	1994	Shuman (1994)[14]
Soquel Creek	500 – 800	1982	Shuman (1994)[14]
	<100	1991	Reavis (1991)
	50 – 100	1994	Shuman (1994)[14]
Aptos Creek	200	1982	Shuman (1994)[14]
	<100	1991	Reavis (1991)
	50 – 75	1994	Shuman (1994)[14]

[14] The basis for the estimates provided by Shuman (1994) appears to be questionable.

indicated that most (82%) of sampled streams (a subset of all historical steelhead streams) had extant populations of juvenile *O. mykiss*.

Previous BRT conclusions

The original BRT concluded that the ESU was in danger of extinction (Busby et al. 1996). Extirpation was considered especially likely in Santa Cruz County and in the tributaries of San Pablo and San Francisco Bays. The BRT suggested that abundance in the Russian River (the largest system inhabited by the ESU) has declined seven-fold since the mid-1960s, but abundance appeared to be stable in smaller systems. Two major sources of uncertainty were: 1) few data on run sizes, which necessitated that the listing be based on indirect evidence, such as habitat degradation; and 2) genetic heritage of populations in tributaries to San Francisco and San Pablo Bays was uncertain, causing the delineaton of the geographic boundaries of the ESU to be uncertain. A status review update (Schiewe 1997) concluded that conditions had improved slightly, and that the ESU was not presently in danger of extinction, but was likely to become so in the foreseeable future (Minorities supported both more and less extreme views on extinction risk.). Uncertainties in the update mainly revolved around inadequate sampling methods for estimating adult and juvenile numbers in various basins.

Listing status

The status of steelhead was formally assessed in 1996 (Busby et al. 1996). The original status review was updated in 1997 (Schiewe 1997), and the Central California Coast ESU was listed as threatened in August 1997.

B.2.7.2 New Updated Analyses

Juvenile data—The juvenile data were collected at numerous sites using a variety of methods. Many of the methods involved the selection of reaches thought to be "typical" or "representative" steelhead habitat; other reaches were selected because they were thought to be typical coho habitat, and steelhead counts were made incidentally to coho counts. In general, the field crew made electro-fishing counts (usually single-pass) of the young-of-the-year and 1+ age classes. Most of the target reaches got sampled several years in a row; thus there are a large number of short time-series. Although methods were always consistent within a time-series, they were not necessarily consistent across time-series.

We analyze these data below. However, we note that these data have limited usefulness for understanding the status of the adult population, due to non-random sampling of reaches within stream systems, non-random sampling of populations within the ESU, and a general lack of estimators shown to be robust for estimating fish density within a reach. In addition, even if more rigorous methods had been used, there is no simple relationship between juvenile numbers and adult numbers (Shea and Mangel 2001), the latter being the usual currency for status reviews. Table B.2.7.4 describes the various possible ways that one might translate juvenile trends into inferences about adult trends.

We calculated trends from the juvenile data. To estimate a trend, the data within each time-series were log-transformed and then normalized, so that each datum represented a deviation from the mean of that specific time-series. The normalization is intended to prevent spurious trends that could arise from the diverse set of methods used to collect the data. Then, the time-series were grouped into units thought to plausibly represent independent populations; the grouping was based on watershed structure. Finally, within each population a linear regression was done for the mean deviation versus year. The estimator for time-trend within each grouping is the slope of the regression line. The minimum length of the time series is 6 years (Other assessments in this status review place the cut-off at 10 yrs.). The recent origin of some relevant time-series and the fact that some of the shorter time-series include information for different age-classes prompted us to consider these slightly smaller datasets.

This procedure resulted in five independent populations for which a trend was estimated. Only downward trends were observed in the five populations (Figure B.2.7.4). The mean trend across all populations was significantly less than zero (H_o: slope ≥ 0; $p < 0.022$ via one-tailed *t*-test against expected value). This suggests an overall decline in juvenile abundance, but it is important to note that such a conclusion requires the assumptions that the assessed populations 1) are indeed independent populations rather than plausibly independent populations, and 2) were randomly sampled from all populations in the ESU.

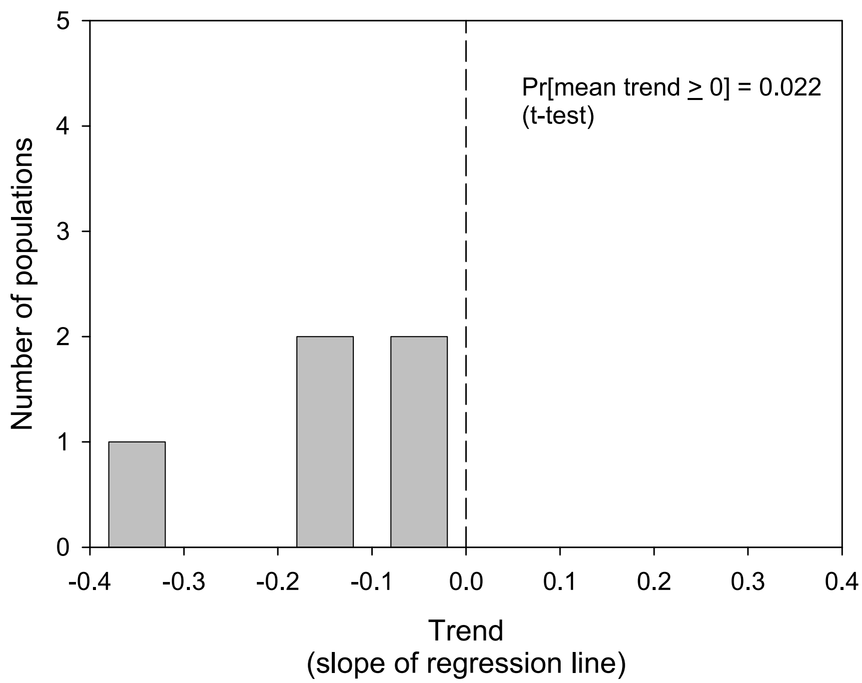

Figure B.2.7.4. Distribution of trends in juvenile densities, for five "independent" populations within the Central Coast steelhead ESU (see text for description of methods). Trend is measured as the slope of a regression line through a time-series; values less than zero indicate decline; values greater than zero indicate increase. Assuming that the populations were randomly drawn from the ESU as a whole, the hypothesis that the ESU is stable or increasing can be statistically rejected ($p = 0.022$); implying an overall decline.

Harvest impacts

Sport harvest of steelhead in the ocean is prohibited by the California Department of Fish and Game (CDFG 2002a), and ocean harvest is a rare event (M. Mohr, NMFS, pers. comm.). Freshwater sport fishing probably constitutes a larger impact.

CDFG (2002b) describes the current freshwater sport fishing regulations for steelhead of the central California ESU. All coastal streams are closed to fishing year round except for special listed streams which allow catch-and-release angling or summer trout fishing. Catch-and-release angling with restricted timing (generally, winter season Sundays, Saturdays, Wednesdays, and holidays) is allowed in the lower mainstems of many coastal streams south of San Francisco (Aptos Creek, Butano Creek, Pescadero Creek, San Gregorio Creek, San Lorenzo River, Scott Creek, Soquel Creek). Notably, Waddell Creek in Santa Cruz Co. had a 5-per day bag limit during the winter, for the short reach between Highway 1 and the ocean; this may have been a mistake as the bag limit was reduced to zero in the supplementary regulations issued in a separate document (CDFG 2002c). Catch and release is allowed year round except April and May in the lower parts of Salmon Creek in Sonoma County and Walker Creek in Marin County. Russian Gulch in Sonoma County has similar regulations except that 1 hatchery fish may be taken in the winter.

The Russian River is the largest system and probably originally supported the largest steelhead population in the ESU. The mainstem is currently open all year and has a bag limit of 2 hatchery steelhead or trout. Above the confluence with the East Branch it is closed year round. Santa Rosa Creek and Laguna Santa Rosa, Sonoma County tributaries to the Russian River, has a summer catch-and-release fishery.

Tributaries to the San Francisco Bay system have less restricted fisheries. All streams in Alameda, Contra Costa, and Santa Clara Counties (east and south Bay) have summer fisheries with bag limit five, except for special cases that are closed all year (Mitchell Creek, Redwood Creek in Alameda Co., San Francisquto Creek and tributaries, and Wildcat Creek). In the north Bay, the lower mainstem of the Napa River has catch-and-release year round except April and May; there is a bag limit of 1 hatchery steelhead or trout. Upper Sonoma Creek and tributaries have a summer fishery with bag limit 5.

For catch-and-release streams, all wild steelhead must be released unharmed. There are significant restrictions on gear used for angling. The CDFG (2000) states that “The only mortality expected from a no-harvest fishery is from hooking and handling injury or stress” (p. 16), and estimates this mortality rate to be about 0.25% - 1.4%. This estimate is based on angler capture rates measured in other river systems throughout California (range: 5% - 28%) , multiplied by an estimated mortality rate of 5% once a fish is hooked. This estimate may be biased downward because it doesn’t account for multiple catch/release events.

Summer trout fishing is allowed in some lakes and reservoirs or in tributaries to lakes, generally with 2 or 5 bag limit.

B.2.7.3 New Hatchery/ESU Information

Current California hatchery steelhead stocks being considered in this ESU include:

Don Clausen Fish Hatchery.
Monterey Bay Salmon & Trout Project.

Don Clausen Fish Hatchery (Warm Springs steelhead [CDFG])

The hatchery and collection site is located on Dry Creek, 14 miles from the confluence of Dry Creek and the Russian River that is 33 miles from the mouth. In 1992, the Coyote Valley Fish Facility was opened at the base of Coyote Valley Dam on the East Fork of the Russian River, 98 miles from the mouth. Both facilities trap fish on site. Coyote Valley fish are trapped and spawned there, but raised at Don Clausen Hatchery. The Coyote Valley steelhead are imprinted for 30 days at the facility before release.

Broodstock origin and history—The hatchery was founded in 1981 and the first steelhead releases were in 1982. The Coyote Valley Fish Facility was opened in 1992. Don Clausen Hatchery has had few out-of-basin transfers into its broodstock. However, significant numbers of Mad River Hatchery steelhead have been released into the basin. In the earlier part of the century, steelhead from Scott Creek were released throughout the basin. Since the Coyote Valley Fish Facility has been constructed, broodstock has been taken from trapping at the facility.

Broodstock size/natural population size—An average of 3,301 fish were trapped from 1992-2002 and 244 females spawned during the broodyears 1992-2002 at Don Clausen Hatchery. At the Coyote Valley Fish Facility, there have been an average of 1,947 steelhead trapped from 1993-2002 and an average of 124 females spawned. There are no steelhead abundance estimates for the Russian River, but fish are widely distributed and plentiful (NMFS, draft HGMP).

Management—Steelhead are 100% ad-clipped, starting in 1998. Both hatchery and naturally spawned fish are included in the broodstock in the proportion that they return to the hatchery until broodyear 2000. Since then, only adipose-marked fish are spawned and all unmarked steelhead are relocated into tributaries of Dry Creek. The production goal for Don Clausen Hatchery is 300,000 yearlings released beginning at December by size and all fish by April. The Coyote Valley Facility's goal is 200,000 yearlings that volitionally release between January and March.

Category—The hatchery is a Category 2 hatchery (SSHAG 2003; Appendix B.5.2). Although some out-of-ESU stocks were present in the basin, there have been no significant introductions since the hatchery began operations. The stock itself has only been cultivated for 20 years. The run is abundant and naturally spawned fish are included in the broodstock until 2000, since that time only adipose-marked steelhead are spawned.

Monterey Bay Salmon & Trout Project (Kingfisher Flat [Big Creek] Hatchery; Scott Creek steelhead)

The Kingfisher Flat Hatchery is located on Big Creek, a tributary of Scott Creek, 6 km miles from the mouth of Scott Creek. Broodstock are taken by divers netting adults usually in Big Creek below the hatchery, but can occur throughout the Scott Creek system (NMFS, draft BO). Steelhead are also taken at a trap on the San Lorenzo River in Felton. San Lorenzo River steelhead are kept separate and released back into the San Lorenzo Basin.

Broodstock Origin and History—The Kingfisher Flat Hatchery began in 1975. However, California state hatchery activity near this site has a long history back to 1904 (Strieg 1991). The state hatchery program ended in 1942 due to flood damage. Under the California state hatchery program, Scott Creek steelhead were widely planted throughout coastal California as they were thought to be an exceptionally healthy stock. The hatchery was damaged by floods in 1941-42 and closed. There are limited records of introductions from Mt. Shasta and Prairie Creek hatcheries into this broodstock. In 1976, the Monterey Bay Salmon & Trout Project began operations at the Big Creek location. Since then, broodstock are taken either in Scott Creek by divers or at a trap in the San Lorenzo River near Felton. Since that time, there have been no introductions into the broodstock. As with all Co-operative hatcheries, the fish are all marked and hatchery fish are usually excluded from broodstock. Fish are released in either Scott Creek or the San Lorenzo River depending on the source of the broodstock.

Broodstock size/natural population size—An average of 98 fish are trapped and 25 females spawned during the 1990-96 broodyears. There are no abundance estimates for Scott Creek and the San Lorenzo River, but juveniles are widespread and abundant (NMFS, draft BO).

Management—Starting in 2000, the practice of planting San Lorenzo fish into the North Fork of the Pajaro River Basin was discontinued. Although the distance is only a matter of miles, it is across ESU boundaries. The current program goal is the restoration of local steelhead stocks.

Population genetics—Alloyzme data groups the Scott Creek, San Lorenzo and Carmel River stocks together (Busby et al. 1996). These three streams falls into the south of the Russian River grouping.

Category—Category 1 hatchery (SSHAG 2003; Appendix B.5.2). The stock has not had out-of-basin introductions in recent years, and hatchery fish are excluded from the broodstock.